Vapor Liquid Equilibrium (VLE) Properties for Binary Refrigerant Mixtures Including Low-GWP Refrigerants by a Newly Developed VLE Apparatus

Yohei Kayukawa [C, S]
AIST, National Metrology Institute of Japan, Tsukuba, Japan
kayukawa-y@aist.go.jp

In the present study, a new apparatus to measure VLE (vapor liquid equilibrium) properties was developed for studying a number of refrigerant mixtures, including low-GWP refrigerants to be used in a high-temperature heat pump cycle. The new apparatus has a tiny sample cell of 8 cm^3 with optical windows, a couple of sampling systems, including a bellows syringe and a sampling valve. Bubble point and dew point pressures in the temperature ranges from (240 to 380) K can be measured with a precision of 0.7 kPa. Refrigerant mixture compositions are measured by a chromatograph with an uncertainty of 0.3 mol%. In addition to the PTxy measurements, the present apparatus has the potential to measure densities at saturation conditions from the peak area of the gas chromatograph. The details of the apparatus are presented, with preliminary results for a binary refrigerant mixture including a hydrofluoroorefin (HFO) refrigerant.